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Subject: Draft Unknown Condition Response Plan - Appendix G of RMPs
Attachments: Draft Unknown Condition Response Plan 4-1-2011.pdf

Hello everyone:

please see the attached draft Unknown Condition Response Plan - currently envisioned to be Appendix G of the Parcel B and G RMPs
please note the PDF includes descriptive text and flowcharts - the flowcharts are the last three pages (G-1, 2 and 3)

thanks,
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(See attached file: Draft Unknown Condition Response Plan 4-1-2011.pdf)

G 1.0 Unknown Conditions - Approach

The potential exists for encountering unknown conditions within Parcels B and G during the course of remediation and/or development. Unknown conditions may include unanticipated soil contamination, abrasive blast material (ABM), unexpected subsurface structures, buried pipelines, unexploded ordnance, radiological devices and/or other visual or olfactory evidence of a release. As part of the site-specific health and safety training that will be required of equipment operators and site workers, instruction will be given on how to identify potential unknown conditions. This unknown condition response plan is consistent with the requirements of Article 31 of the San Francisco Health Code (http://library.municode.com/HTML/14136/book.html).

The overall approach is presented in the attached Main flowchart (Flowchart G-1). Buried physical objects including underground storage tanks (USTs), sumps, barrels, drums, containers, or other underground structures, and/or evidence of contamination, visual or olfactory, could be discovered during grading and site excavation activities. If an unexpected subsurface structure and/or visual or olfactory evidence of contamination is encountered, notification and health and safety procedures will be invoked and work will proceed in accordance with this Unknown Condition Response Plan. Olfactory or visual evidence of contamination which would trigger the use of the Unknown Condition Response Plan include, but are not limited to:

- Oily, shiny or soil saturated with free-phase petroleum product
- Soil with a significant chemical or hydrocarbon-like odor
- Significantly stained or colored soil that reasonably indicates a potential contaminant source
- Groundwater odor, sheen or free-phase globules, or
- Any other indication that contamination may exist that would trigger notification protocols.

Upon the discovery of an unknown condition the Owner must temporarily halt work and determine whether the condition is a mitigating condition (archeological, anthropological, paleontological, or biological/endangered species) or a Navy-retained condition (Unexploded Ordnance, Military Munitions, chemical, radiological, or biological warfare agents, and Radiological Materials) as presented in the Administrative Order On Consent (AOC) and defined in the Early Transfer Cooperative Agreement (ETCA), and whether an appropriate path forward exists so that work can continue safely and in accordance with applicable regulatory protocol. These determinations will be made in accordance with

site specific Environmental Health and Safety Plans (EHSPs) and this Unknown Condition Response Plan. In the case of the discovery of a mitigating condition, work will stop and the appropriate agencies, as per the San Francisco Redevelopment Agency (SFRA) Mitigation Monitoring and Reporting Program (*SFRA/Planning Department, 2010*), will be notified. If the unknown condition is determined to be a Navy-retained condition, work at the location of the unknown condition shall stop, the unknown condition shall be secured and the Navy will be notified of the discovery within twenty-four (24) hours and work will proceed at an alternate location. Although work will be halted at the location of the discovered unknown condition, work may proceed at other locations under the guidance of the Risk Management Plan (RMP).

In order to manage unknown conditions in an appropriate and expedient manner, the presented approach uses field identification and sampling to characterize and determine whether the unknown condition is either a Total Petroleum Hydrocarbon (TPH) condition or a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) condition. The approaches to TPH and CERCLA conditions are presented in the attached TPH and CERCLA Unknown Conditions Flowcharts. If, based on initial characterization sample results, the unknown condition is determined to be a TPH condition, the evaluation will proceed as per the TPH Unknown Condition Flowchart and process (Flowchart G-2) and Section G 2.0. If the unknown condition is determined to be a CERCLA condition, the evaluation will proceed as per the CERCLA Unknown Condition Flowchart and process (Flowchart G-3) and Section G 3.0.

In accordance with the site-specific EHSP, appropriate measures will be undertaken to ensure worker safety in areas where unknown conditions are encountered. The Site Safety and Health Officer (SSHO) will be responsible for evaluating any change in site conditions. The SSHO may stop work to determine if the level of site security and personnel protective equipment is adequate. Additional measures may include conducting contingency monitoring by taking organic vapor readings using portable field screening devices such as an organic vapor monitor (OVM), an organic vapor analyzer (OVA), and/or photoionization detector (PID). If warranted the area in which the unknown condition was encountered will be secured with barricades or fencing, as appropriate, and signage to prevent unauthorized access to the area.

G 1.1 Unknown Conditions – Physical Object

If the encountered unknown condition is a physical object including USTs, sumps, drums, pipelines or other containers discovered during remediation and/or development activities, the Oversight Agencies

(United States Environmental Protection Agency [US EPA], the California Department of Toxic Substances Control [DTSC], the Regional Water Quality Control Board [RWQCB], the Department of the Navy [Navy] and the San Francisco Department of Public Health [SFDPH]) will be notified and the object(s) will be evaluated. If the object(s) is empty, does not require regulatory oversight for its removal, and no evidence of a release is observed, the object will be removed and properly disposed. If the object(s) is not empty, sample(s) from any remaining contents will be collected for initial characterization purposes. Initial characterization sample(s) will be analyzed for the presence of:

- Volatile Organic Compounds (VOCs) including Methyl Tertiary Butyl Ether (MTBE)
- Semi-Volatile Organic Compounds (SVOCs) including Polycyclic Aromatic Hydrocarbons (PAHs)
- Metals
- Pesticides
- Polychlorinated biphenyls (PCBs)
- TPH-Gasoline Range Organics (TPH-GRO)
- TPH-Diesel Range Organics (TPH-DRO)
- TPH-Motor Oil Range Organics (TPH-MORO)

If the initial characterization sample(s) indicate that the object(s) does not contain any TPH or CERCLA chemicals of potential concern (COPCs), the contents of the object(s) will be evacuated, and the object(s) will be removed and properly disposed. If the object is an UST or other object requiring regulatory oversight and determined to contain or to have contained only TPH COPCs, removal or abandonment of the physical object will occur in coordination with and under the oversight of the SFDPH Local Oversight Program (SFDPH/LOP) and the RWQCB, as appropriate. If the object is an UST or other object requiring regulatory oversight and determined to contain or to have contained CERCLA regulated contaminants or "commingled" contaminants (CERCLA and TPH contaminants), removal or abandonment will occur in accordance with CERCLA program unless negotiated otherwise with the Oversight Agencies. Upon removal of the object, the surrounding material will be assessed for evidence of contamination per the requirements of the SFDPH/LOP and/or Oversight Agencies. If no evidence of

contamination is present**,** the object removal activities will be documented, and no further action will be requested in a site close-out letter.

G 1.2 Unknown Conditions – Contaminated Soil

If visual or olfactory evidence of contamination is present in the material (e.g., soil) surrounding a removed object(s) or as a stand-alone evidence of contamination (e.g., encountered stained/odorous soil not associated with a removed object) is encountered, initial characterization sample(s) will be collected of the potentially affected material. If the potentially affected material is associated to a release from a removed object(s), the characterization samples will be analyzed for COPCs detected in the samples collected from the contents of the object(s). If the potentially affected material is not associated with an object, collected initial characterization sample(s) will be analyzed for the presence of:

- VOCs including MTBE
- SVOCs
- Metals
- Pesticides
- Polychlorinated biphenyls (PCBs)
- TPH-GRO
- TPH-DRO
- TPH-MORO

If initial characterization sample(s) indicate that no COPCs are present above TPH Tier 1 Screening Criteria levels (Table G-1) and/or CERCLA remediation goals (Tables G-2 and G-4), no additional characterization work will be required and work will proceed under the RMP. If the results from the initial characterization sample(s) of the visually or olfactorily affected material indicate that COPCs are present in excess of TPH Tier 1 screening levels or remediation goals, corrective actions will be implemented under the TPH or CERCLA programs, as appropriate, and as described in the following sections.

G 2.0 Total Petroleum Hydrocarbons (TPH) Contamination

If after the initial physical object and/or affected material characterization, the unknown condition is determined to be a TPH issue, the following process will be undertaken as outlined in the TPH Unknown Condition Flowchart (Flowchart G-2).

If the unknown condition encountered is a physical object(s), including such items as a UST, pipelines, sump, drum or other containers, the object(s) will be removed or abandoned in coordination with and under the oversight of the SFDPH/LOP and the RWQCB, as appropriate. If there is no visual or olfactory evidence of additional contamination, other than the physical object, no further action will be taken and work will proceed under the guidance of the RMP.

If groundwater with a measureable TPH free-product thickness of greater than 0.01 feet is encountered upon removal of the object, the work will stop and a Corrective Action Plan (CAP) will be prepared and will be submitted for regulatory review. If groundwater without measurable free product is encountered, a grab groundwater sample will be collected and analyzed for Total TPH (TPH-GRO, -DRO, and –MORO), benzene and MTBE. If total TPH concentrations in the collected grab groundwater sample exceed the groundwater screening criteria presented in Table G-1, the work will stop and a CAP will be prepared and submitted for regulatory review. Encountered groundwater that does not exceed the groundwater screening criteria will not be considered a potential threat to human health or marine ecological receptors and no further groundwater action will be necessary.

If no initial groundwater is encountered, but visual or olfactory evidence of contamination is present in the material (e.g. soil) surrounding the object or encountered stand alone material, the Total TPH (TTPH [TPH-GRO, TPH-DRO, and TPH-MORO]) results of the initial characterization sample (collected as per Section G1.2) will be compared to the Hunters Point Petroleum Program Strategy Source and Tier 1 Screening Criteria for shallow soils presented in Table G-1 (*Shaw, 2007*). If TTPH concentrations are above the Source Criteria (e.g., greater than 3,500 mg/kg), the work will stop and a CAP to address the encountered TPH contamination will be prepared. If TPH COPCs are below the Source Criteria, but above the Tier 1 Screening Criteria for shallow soils in the affected material, three options will be available:

1. Excavate affected material laterally and vertically until all visual and olfactory evidence has been removed and field screening device readings indicate contamination has been removed (Section G 2.1)

2. Stop work, secure the TPH condition, and perform a risk based criteria evaluation (risk screening) to determine whether a corrective action is warranted or the detected soil contamination can be left in place upon removal of the object and/or completion of the remediation/redevelopment activity scheduled for the area (Section G 2.2)

3. Stop work, secure the TPH condition, and prepare a CAP to address the encountered TPH contamination (Section G 2.3)

If TPH COPCs are below the Tier 1 Screening Criteria for shallow soils, no soil removal actions will be necessary and no further action will be requested in a site close-out letter.

G 2.1 Excavation of Affected Material

If excavation of the visually or olfactory affected material is selected, the lateral and vertical removal of affected material will proceed. The vertical excavation of the affected material will proceed until the excavation reaches a depth of 10 feet below ground surface (bgs) or until groundwater is encountered. The excavated affected material will be segregated, stockpiled, and secured pending characterization sampling for reuse, further treatment, or off-site disposal.

If groundwater with a measureable free-product thickness of greater than 0.01 feet is encountered during excavation and removal of affected material, the excavation will stop and a CAP will be submitted for regulatory review. If groundwater without measurable free product is encountered, a grab groundwater sample will be collected. The collected grab groundwater sample will be analyzed for TTPH, benzene and MTBE. If TPH COPCs concentrations in the collected grab groundwater sample exceed the groundwater Source Criteria (20,000 µg/L TTPH) and/or Screening Criteria levels (Table G-1), the excavation will stop and a CAP will be submitted for regulatory review. Encountered groundwater that does not exceed the groundwater Screening Criteria will not be considered a potential threat to human health or marine ecological receptors and no further groundwater action will be necessary.

Excavation confirmation samples will be collected from the excavation at a frequency of one discrete bottom sample per 400 square feet of excavation bottom (*ITSI, 2009*). In addition to excavation bottom samples, one sidewall sample will be collected every 20 linear feet of sidewall and collected at the halfway point down the wall for excavations that are less than 10 feet and do not extend to the groundwater (*ITSI, 2009*). For excavations deeper than 5 feet, sidewall samples will be collected on the basis of one sample for every 5 vertical feet of sidewall (*ITSI, 2009*). For smaller excavations (less than 100 square feet) one bottom sample and a sample from each sidewall will be collected. For excavations extending to groundwater, one sidewall sample will be collected from the soil 6-inches above static

groundwater level. Sample locations will be selected by the field personnel based on where the highest remaining contaminant concentrations are expected or field observations indicating the presence of remaining contamination.

Excavation confirmation soil samples will be analyzed for the following COPCs all in accordance with the Petroleum Program Screening Criteria for shallow soils (*Shaw, 2007*):

- TPH-GRO,
- TPH-DRO,
- TPH-MORO,
- BTEX and MTBE and
- PAHs

The results of the excavation confirmation soil samples will be compared to the Tier 1 Screening Criteria for shallow soil (*Shaw, 2007*) as presented in Table G-1.

If concentrations of COPCs are below the Tier 1 Screening Criteria levels, no additional soil removal will occur, a letter describing the work conducted will be submitted to appropriate regulatory agencies, and work will proceed under the guidance of the RMP. If, however, concentration of COPCs remain are above the Tier 1 Screening Criteria levels, the Owner will have the option of: 1) continue incremental excavation and collect additional confirmation samples, 2) stop work and prepare a risk screening to determine whether additional corrective action is warranted and the remaining soil contamination can be left in place, or 3) stop work and prepare a CAP to address the remaining contamination.

G 2.2 Risk Based Criteria Evaluation

If a risk screening is selected, the risk screening will be used to evaluate areas relative to risk and hazard thresholds in support of risk management decisions. A risk based screening criteria using $1x10^{-5}$ as the threshold level for cancer risks and Hazard Index (HI) of 1 was selected to screen data to identify petroleum contaminated areas that may require additional evaluation. If it is determined that encountered/remaining TPH concentration are below the risk based criteria, no additional removal will be required and work will continue under the guidance of the RMP. If the encountered/remaining TPH concentrations exceed risk based screening criteria levels, excavation may be performed to remove the

encountered/remaining TPH affected soil or work will stop, remedial alternatives will be developed and evaluated in a CAP and submitted to the RWQCB.

If encountered/remaining TPH COPCs concentrations represent a level below risk based screening criteria (e.g. cancer risk less than $1x10^{-5}$ and HI less than 1), no additional soil action will be required, the removal activities (if any) and the risk-based screening evaluation will be documented, and no further action will be requested in a site close-out letter.

G 2.3 Corrective Action Plan

If the preparation of a CAP is selected to address the encountered/remaining affected material, work will stop, the TPH condition will be secured, remedial alternatives will be developed and evaluated in a CAP and submitted to the RWQCB.

G 2.4 Segregated Material

Segregated material (e.g. soil) derived during the removal of the encountered object and/or as part of affected material excavation activities will be sampled for characterization. Number of segregated material samples collected for characterization will be as follows (*DTSC, 2001*):

Volume of Segregated Material	Samples per Volume
Up to 1,000 cubic yards	1 sample per 250 cubic yards
1,000 to 5,000 cubic yards	4 samples for first 1,000 cubic yards + 1 sample per each additional 500 cubic yards
Greater than 5,000 cubic yards	12 samples for first 5,000 cubic yards + 1 sample per additional 1,000 cubic yards

DTSC Information Advisory, Clean Imported Fill Material, October 2001.

Segregated material samples will be analyzed for TPH-GRO, TPH-DRO, TPH-MORO, BTEX, MTBE and/or PAHs as appropriate based on the initial characterization analytical results collected when the affected material was first encountered. Sample results will be compared to the Tier 1 Screening Criteria for shallow soil (Table G-1). If TPH COPCs are below the Tier 1 Screening Criteria for shallow soil, the segregated material will be used as fill material that will be placed under the durable cover that constitutes part of the final remedy.

For segregated material that exceeds Tier 1 Screening Criteria for shallow soil, three options will be available:

1. Perform a risk screening to determine whether the segregated material exceed or not risk based criteria (greater than $1x10^{-5}$ or HI greater than 1) if used as fill under the durable cover

2. Treat segregated material on-site until TPH chemical concentrations are below the Tier 1 shallow soil screening criteria or meet risk based criteria if used as fill under the durable cover

3. Haul segregated material offsite

G 3.0 CERCLA Contamination

If during the initial characterization of the unknown condition, CERCLA COPCs are identified that were not identified in the applicable Record of Decision (ROD), work will stop and a Work Plan will be prepared and submitted to the appropriate Oversight Agencies for review. If after the initial characterization, it is determined that the unknown condition is a CERCLA issue with COPCs addressed in the applicable ROD, the following process will be undertaken as outlined in the CERCLA Unknown Condition Flowchart (Flowchart G-3).

If the unknown condition encountered is a physical object including such items as USTs, pipelines, sumps, drums or other containers, the object(s) will be removed or abandoned in coordination with and under the oversight of the Oversight Agencies and SFDPH/LOP, as required. Following removal of the physical object, if there is no visual or olfactory evidence of additional contamination, other than the physical object, no further action will be taken and work will proceed under the guidance of the RMP.

If groundwater is encountered upon removal of the object, the work will stop and, a grab groundwater sample will be collected and analyzed for the presence of VOCs, SVOCs including PAHs, PCBs, metals, pesticides, and TPH constituents as appropriate. If COPCs concentrations in the collected grab groundwater sample exceed the remediation goals for groundwater presented in Tables G-3 (*ChaduxTt, 2009*) and G-4 (*Navy, 2009*), and TPH Tier 1 Screening Criteria (*Shaw, 2007*), as appropriate, the work will stop and a Work Plan will be prepared and submitted for regulatory review. Encountered groundwater that does not exceed the applicable ROD remediation goals and/or TPH Tier Screening Criteria (if applicable) for groundwater will not be considered a potential threat to human health or marine ecological receptors and no further groundwater action will be necessary.

If no initial groundwater is encountered, but visual or olfactory evidence of contamination is present in the material (e.g., soil) surrounding the object or encountered stand alone material, the CERCLA COPCs results of the initial characterization sample (collected as per Section G1.2) will be compared to the applicable ROD remediation goals for soil and TPH Tier 1 Screening Criteria for shallow soil. If COPCs concentrations are above the applicable ROD remediation goals for soil and/or TPH Tier 1 Screening Criteria for shallow soil (if applicable), three options will be available:

1. Excavate affected material laterally and vertically until all visual and olfactory evidence has been removed and field screening device readings indicate contamination has been removed (Section G 3.1).

2. Stop work, secure the CERCLA condition, and perform a risk based criteria evaluation (risk screening) to determine whether a corrective action is warranted or the detected soil contamination can be left in place upon removal of the object and/or completion of the remediation/redevelopment activity scheduled for the area (Section G 3.2).

3. Stop work, secure the CERCLA condition, and prepare a Work Plan to address the encountered CERCLA contamination (Section G 3.3).

If CERCLA COPCs are below the applicable ROD remediation goals for soil and/or Tier 1 Screening Criteria for shallow soil, no soil removal actions will be necessary and no further action will be requested in a site close-out letter.

G 3.1 Excavation of Affected Material

If excavation of the visually or olfactory affected material is selected, the lateral and vertical removal of affected material will proceed. The vertical excavation of the affected material will proceed until the excavation reaches a depth of 10 feet below ground surface (bgs) or until groundwater is encountered. The excavated affected material will be segregated, stockpiled, and secured pending characterization sampling for reuse, further treatment, or off-site disposal.

If groundwater is encountered, a grab groundwater sample will be collected. The collected grab groundwater sample will be analyzed for the presence of VOCs, SVOCs including PAHs, PCBs, metals, pesticides, and TPH constituents as appropriate. If COPCs concentrations in the collected grab groundwater sample exceed the applicable ROD remediation goals for groundwater presented in Tables G-2 and G-4 and/or Tier 1 Screening Criteria in Table G-1 (if applicable), the excavation will stop and a Work Plan will be submitted for regulatory review. Encountered groundwater that does not exceed the applicable ROD remediation goals and/or TPH Screening Criteria (if applicable) will not be considered a potential threat to human health or marine ecological receptors and no further groundwater action will be necessary.

Excavation confirmation samples will be collected from the excavation at a frequency of one discrete sample per 500 square feet of excavation bottom and one sidewall sample will be collected every 17 linear feet of sidewall (*Tetra Tech EM Inc., 2001*). For excavations that exceed a depth of 7 feet, one additional sidewall sample will be collected at every required sidewall sample location (*Navy, 2010*). For smaller excavations (less than 100 square feet) one bottom sample and a sample from each sidewall will be collected. For excavations extending to groundwater and less than 7 feet in depth, sidewall samples will be collected from the soil 6-inches above static groundwater level. For excavation deeper than 7 feet,

one of the required sidewall samples will be collected from the soil 6-inches above the static groundwater level.

Excavation confirmation samples will be analyzed for one or more of the following COPCs as indicated by the applicable ROD (*ChaduxTt, 2009 and Navy, 2009*) and initial characterization of the CERCLA unknown condition:

- VOCs
- SVOCs
- PCBs
- Metals
- Pesticides
- TPH-GRO, TPH-DRO, TPH-MORO, and MTBE (if applicable)

The chemical concentrations detected in the collected excavation confirmation samples will be compared to the applicable ROD remediation goals for soil presented in Tables G-2 and G-4, and TPH Tier 1 Screening Criteria presented in Table G-1 (if applicable).

If excavation confirmation sample results indicate that COPCs above the applicable ROD remedial goals for soil and TPH Tier 1 Screening Criteria for shallow soils (if applicable) are not present, no additional soil removal will be required and work will continue under the guidance of the RMP. If excavation confirmation sample results indicate that COPCs are still present above the ROD remedial goals for soil and/or TPH Tier 1 Screening Criteria for shallow soil, the Owner will have the option of: 1) continue incremental excavation and collect additional confirmation samples, 2) prepare a risk screening to determine whether additional corrective action is warranted and the remaining soil contamination can be left in place, or 3) stop work and prepare a Work Plan to address the remaining contamination.

G 3.2 Risk Based Criteria Evaluation

If a risk screening is selected, the risk screening will be used to evaluate areas relative to risk and hazard thresholds in support of risk management decisions. A risk based screening criteria using $1x10^{-5}$ as the threshold level for cancer risks and Hazard Index (HI) of 1 was selected to screen data to identify CERCLA areas that may require additional evaluation. If it is determined that encountered/remaining COPCs concentration are below the risk based criteria, no additional removal will be required and work will continue under the guidance of the RMP. If the confirmation results indicate that concentrations of

COPCs remain exceed the risk based criteria, excavation may be performed to remove the encountered/remaining soil or work will stop and an investigation Work Plan will be submitted to the Oversight Agencies for review and approval.

G 3.3 Work Plan

If the preparation of a Work Plan is selected to address the encountered/remaining affected material, work will stop, the CERCLA condition will be secured, remedial alternatives will be developed and evaluated in a Work Plan and submitted to the Oversight Agencies.

G 3.4 Segregated Material

Segregated material (e.g. soil) will be sampled for characterization purposes. Number of segregated material samples collected for characterization will be as follows (*DTSC, 2001*):

Volume of Segregated Material	Samples per Volume
Up to 1,000 cubic yards	1 sample per 250 cubic yards
1,000 to 5,000 cubic yards	4 samples for first 1,000 cubic yards + 1 sample per each additional 500 cubic yards
Greater than 5,000 cubic yards	12 samples for first 5,000 cubic yards + 1 sample per additional 1,000 cubic yards

DTSC Information Advisory, Clean Imported Fill Material, October 2001.

Samples will be analyzed for VOCs, SVOCs including PAHs, PCBs, metals, pesticides and/or TPH constituents (if applicable) in accordance with the applicable ROD and initial characterization of the CERCLA unknown condition. Sample results will be compared to the applicable ROD remediation goals for soil (Tables G-2 and G-4) and TPH Tier 1 Screening Criteria for shallow soil (Table G-1). If COPC concentrations are below the ROD remedial goals and TPH Tier 1 Screening Criteria (if applicable), the soil will be used as fill material that will be placed under the durable cover that constitutes part of the final remedy.

For segregated material with COPC concentrations exceeding ROD remedial goals for soil and TPH Tier 1 Screening Criteria (if applicable), three options will be available:

1. Perform a risk screening to determine whether the segregated material exceed or not risk based criteria (greater than $1x10^{-5}$ or HI greater than 1) if used as fill under the durable cover

2. Treat segregated material on-site until CERCLA chemical concentrations are below the applicable ROD remediation goals for soil and/or TPH Tier 1 Screening Criteria (if applicable) or meet risk based criteria if used as fill under the durable cover

3. Haul segregated material offsite

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Table G-1: Petroleum Hydrocarbon Screening Criteria (*Shaw, 2007*)

Tier 1 Screening Criteria for Petroleum Hydrocarbons and Related Constituents in Shallow Soil and Groundwater at Hunters Point

	Shallow Soil (< 10 ft bgs)				**Groundwater/Deep Soil (> 10 ft bgs)**			
	Tier 1 Screening Criteria (mg/kq)				Tier 1 Screening Criteria (µg/L)			
Scenario:	Residential Reuse		Non-Residential Reuse		Residential Reuse		Non-Residential Reuse	
Chemical of Potential Concern	Non-Drinking Water Resources	Drinking Water Resource	Non-Drinking Water Resources	Drinking Water Resource	Non-Drinking Water Resources	Drinking Water Resource	Non-Drinking Water Resources	Drinking Water Resource
Total Petroleum Hydrocarbons								
Gasoline-Range TPH	315	35	315	35	na	42	na	42
Diesel-Range TPH	1,500	35	1,500	35	na	42	na	42
Motor Oil-Range TPH	1,850	1,850	1,850	1,850	na	42	na	42
Total TPH	na	na	na	na	1,400[1]	na	1,400[1]	na
Volatile Organic Compounds								
Benzene	0.12	0.0049	0.26	0.0049	477	6.11	700	0.11
Ethylbenzene	9.4	9.4	9.4	9.4	86	86	86	86
Methy tort butyl ether (MTBE)	29	0.046	37	0.046	8,000	10	8,000	10
Toluene	63	10	210	10	5,000	144	5,000	144
Total Xylenes	31	4.8	100	4.8	91,700	42	161,000	42
Polycyclic Aromatic Hydrocarbons								
Acenephthene	520	60	580	60	710	74	710	74
Acenaphthylene	25	25	25	25	60	60	60	60
Anthracene	230	230	230	230	43	43	43	43
Benzo(a)anthracene	0.38	0.38	1.3	1.3	60	0.055	60	0.055
Benzo(b)fluoranthene	0.38	0.38	1.3	1,3	50	0.056	60	0.056
Benzo(k)fluoranthene	0.38	0.38	1.3	1.3	60	0.056	60	0.056
Benzo(g,b,i)perylere	340	340	3,300	3,300	60	36	60	36
Benzo(a)pyrene	0.038	0.038	6.13	0.13	60	0.0055	60	0.0055
Chrysene	62	14	210	14	60	0.21	60	0.21
Dibenze{a,h)anthracene	0.062	0.062	0.21	0.21	60	0.0092	60	0.0092
Fluoranthene	100	100	100	100	16	16	16	16
Fluorene	140	110	140	140	60	48	60	48
Indeno(1,2,3-cd)pyrene	0.62	0.62	2.1	2.1	60	0,055	60	0.055
Methylnaphthalene (total 1& 2)	49	0.58	490	0.58	26,000	4.8	26,000	4.8
Naphthalene	1.3	0.019	2.8	0.019	470	0.093	470	0.093
Phenanthrene	140	140	140	140	60	60	60	60
Pyrene	730	630	1,040	630	60	36	60	36

Notes: mg/kg = milligrams per kilogram
µg/L = micrograms per liter
na = not applicable

[1] The Total TPH screening criterion of 1,400 µg/L is for the protection of ecological receptors AT THE BAY MARGIN and was developed for and used at former Naval Station Treasure Island in San Francisco, CA, A range of applicable criteria for Total TPH, Benzene and MTBE based on fate and transport modeling was developed for use at former Naval Air Station Alameda Point in Alameda, CA. The applicable criteria vary as a function of distance from the shoreline (*See inset table below).

**Groundwater* Screening *Criteria for TTPH, Benzene, and MTBE* with Distance *From* the *Bay Margin:*

Distance (feet)	Benzene (µg/L)	MTBE (µg/L)	TTPH (µg/L)
0	700	8,000	1,400
25	733	8,380	1,467
50	1,046	11,953	2,092
75	1,608	18,377	3,216
100	2,420	27,653	4,839
125	3,475	39,711	6,949
150	4,769	54,508	9,539
175	6,302	72,025	12,604
200	8,072	92,255	16,145
225	10,079	115,192	20,000**
250	12,323	140,833	20,000**

**Source Criteria for TTPH:

Shallow Soil (less than 10 ft bgs)	Groundwater/Deep Soil (greater than 10 ft bgs)
3,500 mg/kg	20,000 µg/L

Shaw Environmental Inc. (Shaw), 2007. *Final New Preliminary Screening Criteria and Petroleum Program Strategy, Hunters Point Shipyard, San Francisco, California*. December 21.

TABLE G-2: REMEDIATION GOALS FOR SOIL (*ChaduxTt, 2009*)

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Exposure Scenario	Chemical of Concern	Remediation Goal (mg/kg)	Basis for Goal
Residential	Antimony	10	RBC
	Aroclor-1254	0.093	RBC
	Aroclor-1260	0.21	RBC
	Arsenic	11.1	HPAL
	Benzo(a)anthracene	0.37	RBC
	Benzo(a)Pyrene	0.33	PQL
	Benzo(b)fluoranthene	0.34	RBC
	Benzo(k)fluoranthene	0.34	RBC
	Beta-BHC	0.0066	RBC
	Bis(2 ethylhexyl)phthalate	1.1	RBC
	Cadmium	3.5	RBC
	Copper	159	RBC
	Dibenz(a,h)anthracene	0.33	PQL
	Dieldrin	0.0034	PQL
	Heptachlor epoxide	0.0017	PQL
	Indeno(1,2,3-cd)pyrene	0.35	RBC
	Iron	58,000	HPAL
	Lead	155	RBC
	Manganese	1,431	HPAL
	Mercury	2.3	HPAL
	Naphthalene	1.7	RBC
	Tetrachloroethene	0.48	RBC
	Trichloroethene	2.9	RBC
	Vanadium	117	HPAL
	Zinc	373	RBC
Recreational	Aroclor-1254	0.74	RBC
	Aroclor-1260	0.74	RBC
	Arsenic	11.1	HPAL
	Benzo(a)pyrene	0.33	PQL
	Lead	155	RBC
Industrial	Arsenic	11.1	HPAL
	Benzo(a)anthracene	1.8	RBC
	Benzo(a)Pyrene	0.33	PQL
Construction Worker	Aroclor-1260	2.1	RBC
	Arsenic	11.1	HPAL
	Benzo(a)pyrene	0.65	RBC
	Lead	800	RBC
	Trichloroethene	151	RBC

Notes:

Exposures in the residential, industrial, and construction worker scenarios consider exposure to soil from 0 to 10 feet below ground surface. The recreational exposure scenario considers exposure to soil from 0 to 2 feet below ground surface.

HPAL	Hunters Point ambient level	PQL	Practical quantitation limit
mg/kg	Milligram per kilogram	RBC	Risk-based concentration

ChaduxTt, A Joint Venture of St George Chadux Corp. and Tetra Tech EM Inc. (ChaduxTt), 2009. *Final Amended Parcel B Record of Decision, Hunters Point Shipyard, San Francisco, California*. January 14.

TABLE G-3: REMEDIATION GOALS FOR GROUNDWATER (*ChaduxTt, 2009*)

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Exposure Scenario	Chemical of Concern	Remediation Goal (µg/L)	Basis for Goal
A-Aquifer Groundwater			
Residential Vapor	1,2,4-Trichlorobenzene	66	RBC
	1,2,4-Trimethylbenzene	25	RBC
	1,2-Dichlorobenzene	2,561	RBC
	1,2-Dichloroethane	2.3	RBC
	1,2-Dichloroethene (total)	209	RBC
	1,2-Dichloropropane	1.1	RBC
	1,3,5-Trimethylbenzene	19	RBC
	1,4-Dichlorobenzene	2.1	RBC
	2-Methylnaphthalene	707	RBC
	Benzene	0.5	PQL
	Bromodichloromethane	1	RBC
	Chlorobenzene	392	RBC
	Chloroethane	6.5	RBC
	Chloroform	1.0	PQL
	cis-1,2-Dichloroethene	209	RBC
	Dichlorodifluoromethane	14	RBC
	Mercury	0,68	RBC
	Methylene chloride	27	RBC
	Naphthalene	3.6	RBC
	Tetrachloroethene	1	PQL
	trans-1,2-Dichloroethene	182	RBC
	Trichloroethene	2.9	RBC
	Trichlorofluoromethane	176	RBC
	Vinyl chloride	0.5	PQL
Industrial Vapor Intrusion	Chloroform	1.2	RBC
Construction Worker Trench Exposure	1,2,4-Trichlorobenzene	55	RBC
	1,2,4-Trimethylbenzene	72	RBC
	1,2-Dichlorobenzene	2,215	RBC
	1,2-Dichloroethane	30	RBC
	1,2-Dichloroethene (total)	363	RBC
	1,2-Dichloropropane	40	RBC
	1,4-Dichlorobenzene	68	RBC
	2,4,6-Trichlorophenol	15	RBC
	2,4-Dimethylphenol	9,801	RBC
	2,4-Dinitrotoluene	179	RBC
	2-Methylnaphthalene	140	RBC
	4-Methylphenol	3,500	RBC

TABLE G-3: REMEDIATION GOALS FOR GROUNDWATER (CONTINUED)

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Exposure Scenario	Chemical of Concern	Remediation Goal (µg/L)	Basis for Goal
A-Aquifer Groundwater (Continued)			
Construction Worker Trench Exposure (Continued)	Arsenic	40	RBC
	Benzene	22	RBC
	Benzo(a)anthracene	2	PQL
	Benzo(a)pyrene	2	PQL
	Bromodichloromethane	26	RBC
	Chlorobenzene	594	RBC
	Chloroform	36	RBC
	Chrysene	6.4	RBC
	cis-1,2-Dichloroethene	363	RBC
	Mercury	4.68	RBC
	Naphthalene	20	RBC
	Pentachlorophenol	25	PQL
	Tetrachloroethene	19	RBC
	trans-1,2-Dichloroethene	721	RBC
	Trichloroethene	374	RBC
	Vinyl chloride	7.2	RBC
B-Aquifer Groundwater			
Residential Domestic Use	1,4-Dichlorobenzene	7.5	ARAR
	Antimony	43.26	HGAL
	Arsenic	27.34	HGAL
	Benzene	5	ARAR
	Chloroethane	4.6	RBC
	Manganese	8,140	HGAL
	Pentachlorophenol	25	PQL
	Thallium	12.9 7	HGAL
	Trichloroethene	5	ARAR

Notes:

Remediation goals for VOCs to address exposure via indoor inhalation of vapors may be superseded based on COC identification information from soil gas surveys that may be conducted in the future. These future action levels would be established for soil gas, would account for vapors from both soil and groundwater, and would be calculated based on a cumulative risk level of 10^{-6} using the accepted methodology for risk assessments at HPS.

µg/L Micrograms per liter
ARAR Applicable or relevant and appropriate requirement
HGAL Hunters Point groundwater ambient level
PQL Practical quantitation limit
RBC Risk-based concentration

ChaduxTt, A Joint Venture of St George Chadux Corp. and Tetra Tech EM Inc. (ChaduxTt), 2009. *Final Amended Parcel B Record of Decision, Hunters Point Shipyard, San Francisco, California*. January 14.

Table G-4. Remediation Goals for Soil and Groundwater (*Navy, 2009*)
Parcel G Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Exposure Scenario	Chemical of Concern	Remediation Goal / Basis
Soil (mg/kg)		
Residential	Manganese	1,431 / HPAL
Recreational	Arsenic	11.1 / HPAL
	Benzo(a)pyrene	0.33 / RBC
Industrial	Arsenic	11.1 / HPAL
	Benzo(a)pyrene	0.33 / PQL
	Benzo(b)fluoranthene	1.76 / RBC
	Lead	800 / RBC
Construction Worker	Arsenic	11.1 / HPAL
	Benzo(a)pyrene	0.65 / RBC
	Lead	800 / RBC
	Manganese	6,889 / RBC
Groundwater (µg/L)		
Residential – Vapor Intrusion	Chloroform	1.0 / PQL
	Methylene Chloride	27 / RBC
	Trichloroethene	2.9 / RBC
Industrial – Vapor Intrusion	Benzene	0.63 / RBC
	Carbon Tetrachloride	0.50 / PQL
	Chloroform	1.2 / RBC
	Naphthalene	6.0 / RBC
	Tetrachloroethene	1.0 / PQL
	Trichloroethene	4.8 / RBC
	Xylene (total)	337 / RBC
Construction Worker – Trench Exposure	Arsenic	40 / RBC
	Benzene	17 / RBC
	Naphthalene	17 / RBC
	Tetrachloroethene	18 / RBC
	Xylene (total)	861 / RBC

Notes:

Soil remediation goals are in milligrams per kilogram (mg/kg).

Groundwater remediation goals are in micrograms per liter (µg/L).

Exposures in the residential, industrial, and construction worker scenarios consider exposure to soil from 0 to 10 feet below ground surface. The recreational exposure scenario considers exposure to soil from 0 to 2 feet below ground surface.

Remediation goals for volatile organic compounds to address exposure via indoor inhalation of vapors may be superseded based on chemicals of concern identification information from soil gas surveys that may be conducted in the future. These future action levels would be established for soil gas, would account for vapors from both soil and groundwater, and would be calculated based on a cumulative risk level of 10^{-6} using the accepted methodology for risk assessments at the Hunters Point Shipyard.

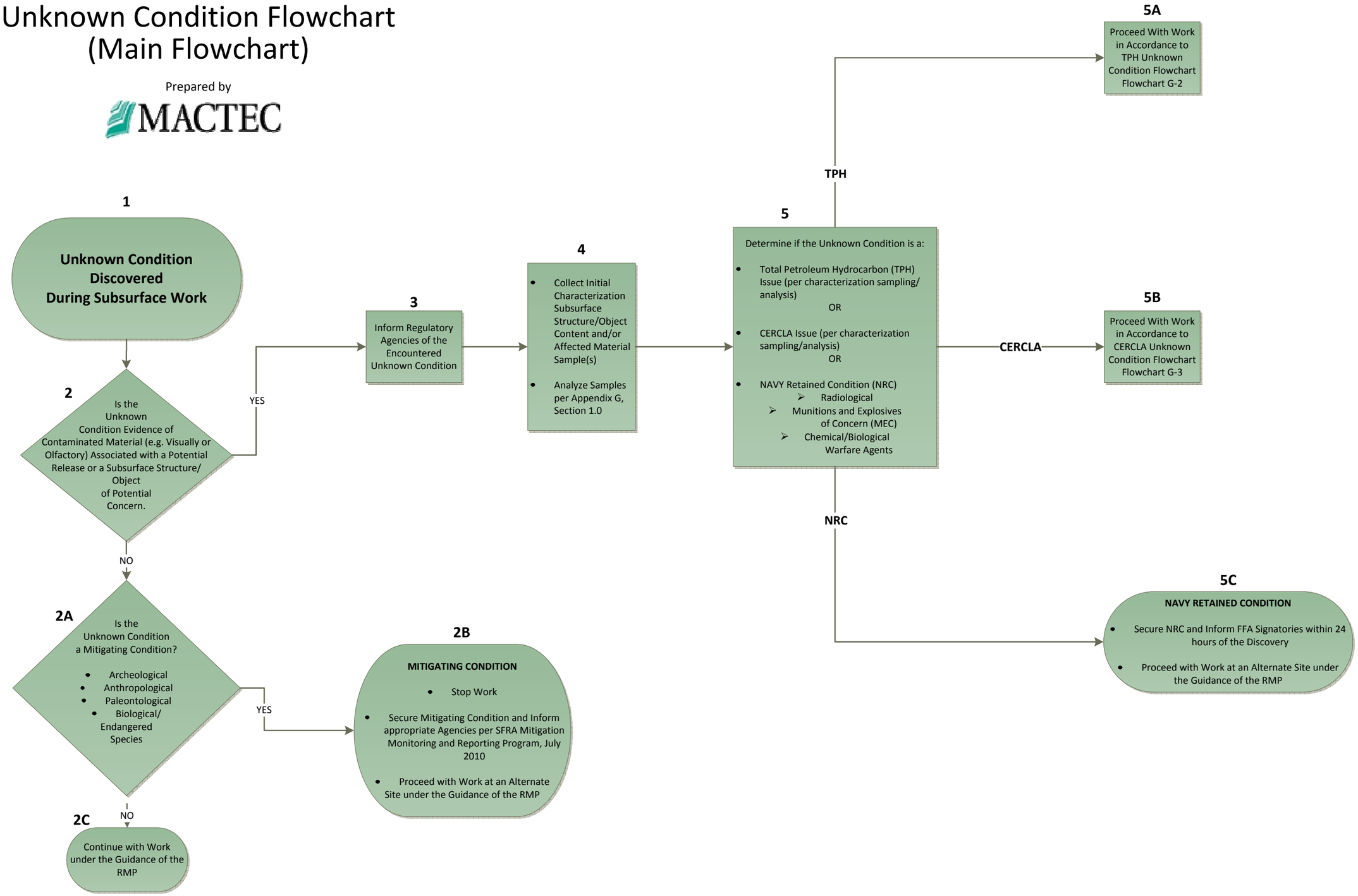
HPAL Hunters Point ambient level PQL Practical quantitation limit RBC Risk-based concentration

Department of the Navy (Navy), 2009. *Final Record of Decision for Parcel G, Hunters Point Shipyard, San Francisco, California*. February 18.

DRAFT Flowchart G-1
Unknown Condition Flowchart
(Main Flowchart)

Prepared by

MACTEC



03/25/2011

DRAFT Flowchart G-2
TPH Unknown Condition Flowchart

Prepared by

MACTEC

1

TPH Unknown Condition Discovered During Subsurface Work

2

Is the Unknown Condition a Physical Object?

- Tank
- Sump
- Pipeline
- Drums

YES

2A

Is the Unknown Condition an UST or an Object Requiring Removal under Regulatory Oversight?

NO

2B

Remove Object and Dispose Off-Site

NO

YES

2C

Remove UST/Object Under San Francisco Department of Public Health Local Oversight Program (SFDPH/LOP) with Appropriate RWQCB Oversight.

2D

Was Groundwater Encountered During the Removal of the UST/Object?

NO

YES

2E

Is There Evidence of Contaminated Material (e.g. Visually or Olfactory) Associated with a Potential Release above Screening Levels?

NO

2F

- Removal Action Complete
- Proceed with Additional Work Under the Guidance of the RMP

YES

3

Excavate and Segregate Visibly/ Olfactorily Affected Material (Section G2.1)

OR

Prepare a Risk Analysis (Section G2.2)

OR

Stop Work and Prepare a Corrective Action Plan for Regulatory Review (Section G2.3)

4

Was Groundwater Encountered During the Excavation/ Removal of the Affected Material?

NO

YES

4A

Is there Free Product Present at a Thickness of >0.01 ft?

NO

YES

4B

Collect Grab Groundwater Sample for:

- TTPH
- Benzene
- MTBE

4C

Do Groundwater Characterization Samples Indicate TPH COPCs Above Screening Levels?

YES

NO

4D

- Stop Work
- Secure Excavation
- Prepare and Submit a Corrective Action Plan for Regulatory Review

4E

- Groundwater Not Impacted
- No Groundwater Remediation Required

5

Collect **Segregated Material *Characterization*** Samples per Appendix G, Section 2.0.

Segregated Material Characterization

Collect **Excavation Confirmation** Samples per Appendix G, Section 2.0.

Excavation Confirmation

5A

Analyze **Segregated Material *Characterization* Samples** for:

- TPH-GRO
- TPH-DRO
- TPH-MORO
- BTEX and MTBE
- PAHs

As Appropriate

5B

Analyze **Excavation Confirmation Samples** for:

- TPH-GRO
- TPH-DRO
- TPH-MORO
- BTEX and MTBE
- PAHs

As Appropriate

6A

Do **Segregated Material *Characterization* Samples** Indicate TPH Chemicals of Potential Concern (COPCs) **Above** Petroleum Program Strategy Screening Levels in the Segregated Material?

YES

NO

6B

Do **Excavation Confirmation Samples** Indicate TPH Chemicals of Potential Concern (COPCs) **Above** Petroleum Program Strategy Screening Levels Remain in the Excavation?

YES

NO

7A

Do TPH Chemical Concentrations in the Segregated Material Represent Either a **Cancer Risk Above $1x10^{-5}$ or a HI ≥ 1**?

YES

7B

Do Remaining TPH Chemical Concentrations in the Excavation Represent Either a **Cancer Risk Above $1x10^{-5}$ or a HI ≥ 1**?

YES

NO

8A

Is Segregated Material Suitable for On-Site Treatment?

NO

YES

8B

- Stop Work
- Secure Excavation
- Prepare and Submit a Corrective Action Plan for Regulatory Review

9A

Dispose of Segregated Material Off-Site

9B

- No Additional Soil Removal Required
- Proceed with Additional Work under the Guidance of the RMP.

10A

Treat and Resample Segregated Material Until TPH Chemical Concentrations are **BELOW** Screening Levels or **Cancer Risk Below $1x10^{-5}$ or HI=<1**

10B

Continue Incremental Excavation and Segregation of Affected Material

11A

Reuse Segregated Material Under the Cover

NO

NO

YES

03/25/2011

DRAFT Flowchart G-3
CERCLA Unknown Condition Flowchart

Prepared by

MACTEC

1

CERCLA Unknown Condition Discovered During Subsurface Work

2 Does the Unknown Condition Contain **Hazardous Chemicals Addressed in the ROD**?

NO → Stop Work; Secure Excavation; Prepare and Submit Investigation Work Plan for Regulatory Review

YES → **2A** Is the Unknown Condition a Physical Object?
- Tank
- Sump
- Pipeline
- Drums

YES → **2B** Is the Unknown Condition an UST or an Object Requiring Removal under Regulatory Oversight?

NO → **2C** Remove Object and Dispose Off-Site

YES → **2D**
- Inform FFA Signatories
- Remove UST/ Object Under San Francisco Department of Public Health Local Oversight Program (SFDPH/LOP) and Appropriate FFA Signatory Oversight

2E Was Groundwater Encountered During the Removal of the UST/Object?

NO → **2F** Is There Evidence of Contaminated Material (e.g. Visually or Olfactory) Associated with a Potential Release above Remediation Goals?

NO → **2G**
- Removal Action Complete
- Proceed with Additional Work Under the Guidance of the RMP

YES → **3** Excavate and Segregate Visibly/ Olfactorily Affected Material (Section G3.1)

OR

Prepare a Risk Analysis (Section G3.2)

OR

Stop Work and Prepare a Work Plan for Regulatory Review (Section G3.3)

4 Was Groundwater Encountered During the Excavation/ Removal of the Affected Material?

NO → **5** Collect Segregated Material ***Characterization*** Samples per Appendix G, Section 3.0.

Collect Excavation **Confirmation** Samples per Appendix G, Section 3.0.

Segregated Material Characterization

Excavation Confirmation

5A Analyze Segregated Material ***Characterization*** Samples for:
- VOCs
- Metals
- PAHs
- PCBs
- Pesticides

As appropriate

5B Analyze Excavation **Confirmation** Samples for:
- VOCs
- Metals
- PAHs
- PCBs
- Pesticides

As Appropriate

6B Do **Confirmation** Samples Indicate CERCLA Chemicals of Potential Concern (COPCs) **Above** ROD Remediation Goals Remain in the Excavation?

YES → **10B** Continue Incremental Excavation and Segregation of Affected Material → **4A** Collect Grab Groundwater Sample for:
- VOCs
- Metals
- PAHs
- PCBs
- Pesticides

NO → **9B**
- No Additional Soil Removal Required
- Proceed with Additional Work under the Guidance of the RMP.

YES → **7B** Do Remaining CERCLA Chemical Concentrations in the Excavation Represent Either a **Cancer Risk Above 1x10^{-5} or a HI ≥ 1**?

YES → **8B**
- Stop Work
- Secure Excavation
- Prepare and Submit Investigation Work Plan for Regulatory Review

NO → **10A** Treat and Resample Segregated Material Until CERCLA COPCs Concentrations are **BELOW** Remediation Goals or **Cancer Risk Below 1x10^{-5} or HI=<1**

4B Do Groundwater Characterization Samples Indicate CERCLA COPCs Above Screening Levels?

YES → **4C**
- Stop Work
- Secure Excavation
- Prepare and Submit Investigation Work Plan for Regulatory Review

NO → **4D**
- Groundwater Not Impacted
- No Groundwater Remediation Required

6A Do Segregated Material ***Characterization*** Samples Indicate CERCLA Chemicals of Potential Concern (COPCs) **Above** ROD Remediation Goals in the Segregated Material?

NO → **11A** Reuse Segregated Material Under the Cover

YES → **7A** Do CERCLA Chemical Concentrations in the Segregated Material Represent Either a **Cancer Risk Above 1x10^{-5} or a HI ≥ 1**?

YES → **8A** Is Segregated Material Suitable for On-Site Treatment?

NO → **9A** Dispose of Segregated Material Off-Site

YES → **10A** Treat and Resample Segregated Material Until CERCLA COPCs Concentrations are **BELOW** Remediation Goals or **Cancer Risk Below 1x10^{-5} or HI=<1**

03/25/2011